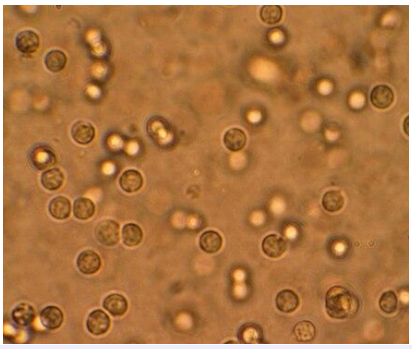
Urinary Tract Infection (UTI)

A **urinary tract infection** (UTI) is an infection that affects a part of the urinary tract. Lower UTIs may involve the bladder (cystitis) or urethra (urethritis) while upper UTIs affect the kidney (pyelonephritis).



Multiple white cells seen in the urine of a person with a urinary tract infection using microscopy

Signs and Symptoms

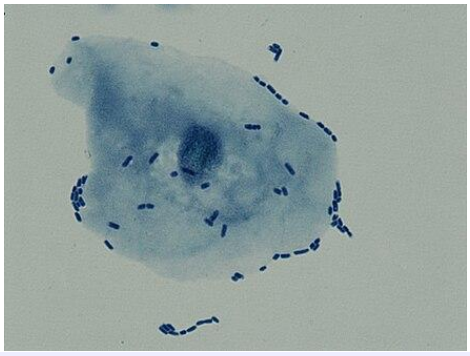
Lower urinary tract infection, also known as a bladder infection, presents with burning during urination and frequent urination. These symptoms can vary from mild to severe and typically last around six days. Some may experience pain above the pubic bone or in the lower back. Upper urinary tract infection, or pyelonephritis, includes flank pain, fever, or nausea and vomiting, often in addition to the symptoms of a lower UTI. Rarely, urine may appear bloody or contain visible pus.

Urine may contain pus (a condition known as pyuria) as seen from a person with sepsis due to a urinary tract infection

In children, UTIs may present with non-specific symptoms like fever, poor feeding, vomiting, sleepiness, or jaundice. In the elderly, symptoms are often vague, including incontinence, a change in mental status, or fatigue.

Causes and Risk Factors

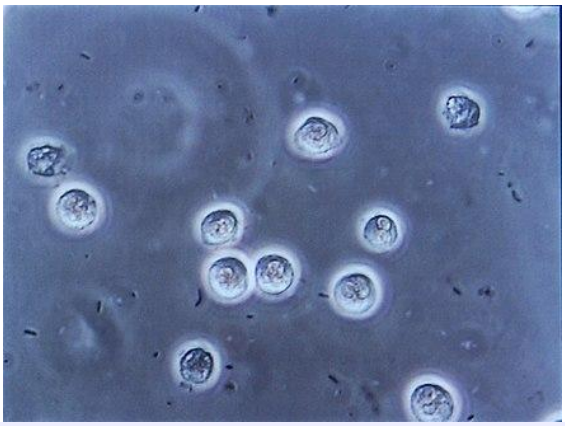
The most common cause of UTIs is *Escherichia coli*, responsible for 80–85% of cases. Other bacteria and fungi can also cause UTIs. Risk factors include female anatomy, sexual intercourse, diabetes, obesity, catheterisation, and family history. Women are more prone to UTIs due to their shorter urethra. Sexual activity is a significant risk factor, particularly in young women.



Uropathogenic *E. coli* cells adhered to bladder epithelial cell

Diagnosis

Diagnosis in young, healthy women can often be based on symptoms alone. In complicated cases or when symptoms are vague, urinalysis and urine culture are used to confirm the diagnosis. Urinalysis looks for urinary nitrites, white blood cells, or leukocyte esterase. A urine culture is considered positive with a bacterial colony count of $\geq 10^3$ CFU/mL.



Multiple bacilli (rod-shaped bacteria) shown between white blood cells in urinary microscopy

Treatment

Uncomplicated UTIs are treated with a short course of antibiotics such as nitrofurantoin or trimethoprim/sulfamethoxazole. Resistance to these antibiotics is increasing, so in complicated cases, a longer course or intravenous antibiotics may be necessary. Phenazopyridine may help with symptoms, though it is not routinely recommended.

Uncomplicated

Antibiotics like trimethoprim/sulfamethoxazole, nitrofurantoin, or fosfomycin are typically first-line treatments. A three-day course is usually sufficient, though nitrofurantoin requires 5–7 days.

Complicated

These require more aggressive treatment and follow-up. Increased antibiotic resistance is making treatment more challenging. A longer course or intravenous antibiotics is often needed.

Asymptomatic Bacteriuria

Generally, asymptomatic bacteriuria is not treated with antibiotics unless the patient is pregnant, has diabetes, or is undergoing urinary tract procedures likely to cause bleeding. Pregnant women are treated to prevent risks like pyelonephritis, low birth weight, and preterm birth.

Pyelonephritis

Treatments include longer courses of oral antibiotics or intravenous antibiotics. Commonly used antibiotics include ciprofloxacin, trimethoprim/sulfamethoxazole, or amoxicillin/clavulanate. Severe cases may require hospitalization.

Prognosis

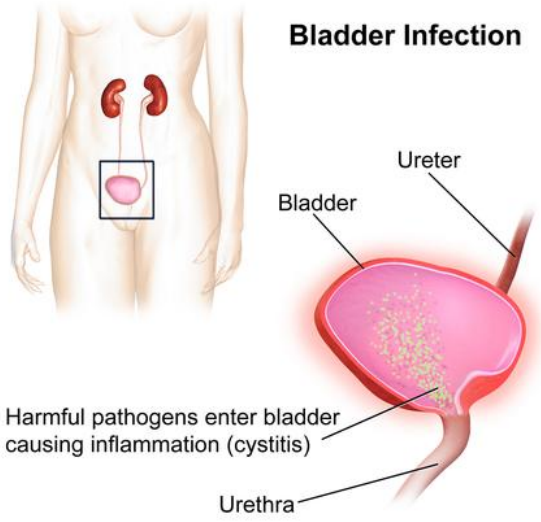
With treatment, symptoms generally improve within 36 hours. However, 15–25% of adults and children may experience chronic symptomatic UTIs, including recurrent infections. Recurrent UTIs are defined as at least two infections in six months or three in twelve months.

Epidemiology

UTIs are the most frequent bacterial infection in women, with 10% affected yearly and 40–60% experiencing an infection at some point in their lives. UTIs occur four times more frequently in females than males. They are also a common cause of hospital-acquired infections, especially in elderly women in care homes.

History

UTIs have been described since ancient times, with the first documented description in the Ebers Papyrus dated to c. 1550 BC. Effective treatment became available with the advent of antibiotics in the 1930s.



Bladder infection

Self-assessment MCQs (select the best answer)

1. **Which part of the urinary tract is affected by cystitis?**
a. Kidney
b. Urethra
c. Bladder
d. Prostate
e. Ureter

2. **What is the most common cause of UTIs?**
a. Staphylococcus aureus
b. Escherichia coli
c. Pseudomonas aeruginosa_
d. Candida albicans
e. Klebsiella pneumoniae

3. **Which symptom is commonly associated with upper urinary tract infection (pyelonephritis)?**
a. Burning during urination
b. Frequent urination
c. Flank pain
d. Pain above the pubic bone
e. Incontinence

4. **What is the typical duration for symptoms of a lower UTI to last?**
a. 1 day
b. 3 days
c. 6 days
d. 10 days
e. 14 days

5. Which antibiotic is commonly used as a first-line treatment for uncomplicated UTIs?
a. Amoxicillin
b. Ciprofloxacin
c. Nitrofurantoin
d. Metronidazole
e. Vancomycin

6. What is a significant risk factor for developing UTIs, especially in young women?
a. High-fat diet
b. Sedentary lifestyle
c. Sexual activity
d. Lack of sleep
e. Excessive exercise

7. What is a common finding in urinalysis that suggests a UTI?
a. Red blood cells
b. Platelets
c. Leukocyte esterase
d. Glucose
e. Bilirubin

8. In which group is asymptomatic bacteriuria usually treated with antibiotics?
a. Children
b. Healthy adults
c. Pregnant women
d. Elderly people
e. Athletes

9. Which historical document contains one of the earliest descriptions of UTIs?
a. The Hippocratic Corpus
b. The Ebers Papyrus
c. The Edwin Smith Papyrus
d. The Canon of Medicine
e. The Materia Medica

10. What is the definition of recurrent UTIs?
a. At least one infection in a year
b. At least two infections in a year
c. At least three infections in a year
d. At least two infections in six months or three in twelve months
e. At least four infections in a month

WEEK 5: Nursing Care for Patients With

- Renal stone
- Prostatic hyperplasia
- Ca bladder
- End stage of renal failure
- Renal replacement therapy

Kidney stone disease

Kidney stone disease, also known as renal calculus disease, nephrolithiasis, or urolithiasis, involves the formation of solid mineral 'stones' within the urinary tract. These stones typically form in the kidneys and can pass through the urinary tract. Small stones often pass without symptoms, but larger stones can cause severe pain, blood in the urine, vomiting, or painful urination.

Signs and Symptoms

The hallmark of kidney stones is excruciating, intermittent pain radiating from the flank to the groin or inner thigh, known as renal colic. Pain is typically accompanied by urinary urgency, restlessness, hematuria (blood in the urine), sweating, nausea, and vomiting. The pain comes in waves lasting 20 to 60 minutes due to peristaltic contractions of the ureter as it attempts to expel the stone. Pain in the lower-left quadrant can sometimes be confused with diverticulitis.

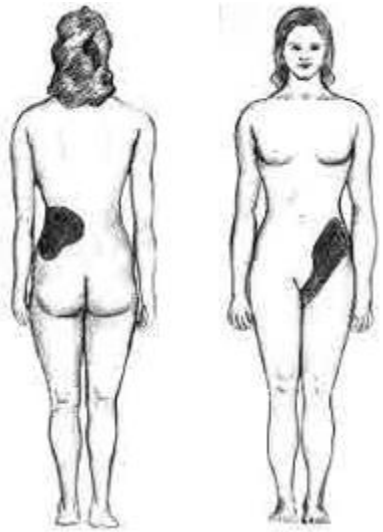
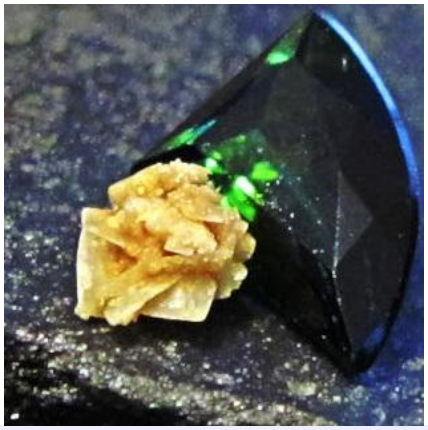


Diagram showing the typical location of renal colic, below the rib cage to just above the pelvis

Risk Factors

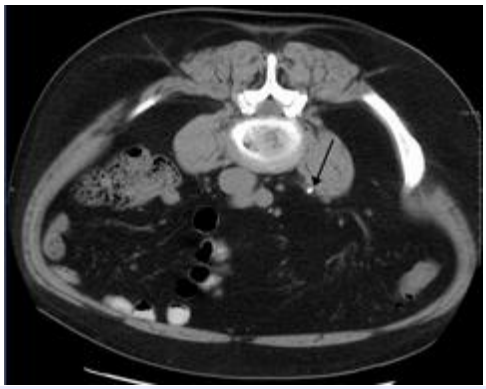
Dehydration, high dietary intake of animal protein, sodium, sugars, and certain metabolic conditions like hyperparathyroidism and gout can increase the risk of stone formation. Obesity, sedentary lifestyles, and living in warm climates also contribute to higher risk. Some medications, such as calcium supplements, and conditions like Crohn's disease are associated with kidney stones.



A kidney stone (yellow) composed of calcium oxalate

Diagnosis

Diagnosis is based on symptoms, urine testing, and medical imaging. Imaging studies include non-contrast helical CT scans, which are the diagnostic method of choice. Renal ultrasonography can also be useful, especially in children or pregnant women.



Axial CT scan of abdomen without contrast, showing a 3-mm stone (marked by an arrow) in the left proximal ureter

Laboratory investigations include microscopic examination of urine, urine culture, complete blood count, renal function tests, and 24-hour urine collection. Chemical analysis of stones can guide preventive and therapeutic management.

Struvite crystals found on microscopic examination of the urine

Prevention

Preventive measures depend on the type of stones. General recommendations include increasing fluid intake to produce more than two liters of urine per day and avoiding soft drinks containing phosphoric acid. Specific dietary adjustments and medications like thiazide diuretics, citrate, or allopurinol may also be recommended.

Dietary Measures

Preventive strategies involve a combination of dietary modifications and medications. Recommendations include:

- Increasing fluid intake to achieve more than two litres per day of urine output.
- Limiting animal protein intake.
- Increasing citrate intake from sources like lemon and lime juice.
- Reducing sodium intake.

Urine Alkalinization

For uric acid stones, alkalinization of urine using medications or dietary supplements like alkali citrate, sodium bicarbonate, or potassium citrate is recommended. Testing urine pH periodically can help maintain optimal conditions for stone dissolution.

Treatment

Pain Management

Pain management often requires intravenous NSAIDs or opioids. Oral medications can be effective for less severe pain, and the use of antispasmodics does not provide additional benefits.

Medical Expulsive Therapy

Medications like alpha adrenergic blockers (e.g., tamsulosin) or calcium channel blockers (e.g., nifedipine) can speed the spontaneous passage of stones in the ureter. These medications may reduce pain, hospital visits, and the need for further interventions.

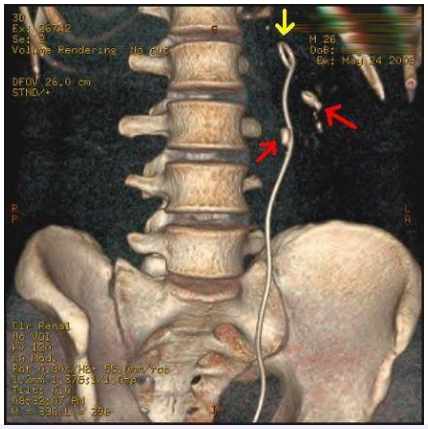
Lithotripsy

Extracorporeal shock wave lithotripsy (ESWL) is a noninvasive technique for breaking kidney stones using high-intensity pulses of ultrasonic energy. It is effective for stones near the renal pelvis and upper ureter, provided the stone burden is less than 20 mm.

A lithotriptor machine with a mobile fluoroscopic system ("C-arm") is seen in an operating room

Surgery

For stones that do not pass spontaneously or cause severe complications, surgical interventions may be necessary. Techniques include ureteroscopy, which involves the use of a stent to bypass an obstruction, and more invasive procedures like percutaneous nephrolithotomy for large or complicated stones.



Three-dimensional reconstructed CT scan image of a ureteral stent in the left kidney

Kidney stone disease is a common and recurring condition that requires careful management and preventive strategies. Understanding its risk factors, diagnostic methods, and treatment options is very important for effective patient care.

Self-assessment MCQs (select the best answer)

1. **What is the hallmark symptom of kidney stones?**
a. Consistent dull pain in the lower back
b. Excruciating, intermittent pain radiating from the flank to the groin
c. Mild abdominal discomfort
d. Continuous headache
e. Chest pain

2. **Which imaging study is the diagnostic method of choice for kidney stones?**
a. MRI
b. X-ray
c. Non-contrast helical CT scan
d. PET scan
e. Renal scintigraphy

3. **Which dietary measure is recommended to prevent kidney stones?**
a. Increasing sodium intake
b. Reducing fluid intake
c. Increasing fluid intake to produce more than two liters of urine per day
d. Increasing animal protein intake
e. Increasing sugar intake

4. **Which medication can be used for the alkalization of urine to prevent uric acid stones?**
a. Thiazide diuretics

b. NSAIDs
c. Sodium bicarbonate
d. Opioids
e. Antispasmodics

5. What is the purpose of extracorporeal shock wave lithotripsy (ESWL)?
a. To dissolve stones through medication
b. To break kidney stones using high-intensity pulses of ultrasonic energy
c. To prevent the formation of new stones
d. To remove stones via surgery
e. To alleviate pain

6. Which of the following is NOT a risk factor for kidney stone formation?
a. Dehydration
b. High dietary intake of animal protein
c. Living in warm climates
d. High fluid intake
e. Obesity

7. Which laboratory investigation is used for guiding preventive and therapeutic management of kidney stones?
a. Urine culture
b. Microscopic examination of urine
c. Chemical analysis of stones
d. Renal function tests
e. Complete blood count

8. What type of crystals might be found on microscopic examination of the urine in patients with kidney stones?
a. Uric acid crystals
b. Calcium phosphate crystals
c. Struvite crystals
d. Cystine crystals
e. Silica crystals

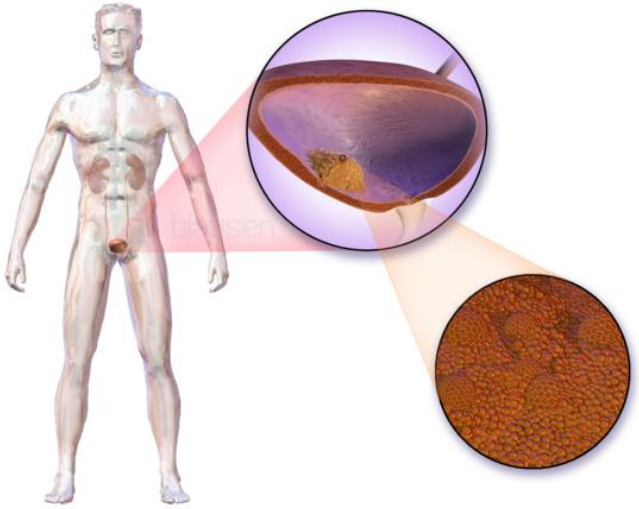
9. Which medication can be used to facilitate the spontaneous passage of stones in the ureter?
a. NSAIDs
b. Calcium supplements
c. Alpha adrenergic blockers
d. Opioids
e. Antispasmodics

10. For which condition might a ureteral stent be used as a treatment?
a. Chronic kidney disease
b. Severe complications from kidney stones that do not pass spontaneously
c. Hypertension
d. Diabetes
e. Urinary tract infection

Bladder Cancer

Bladder cancer arises from the tissues of the urinary bladder and is a significant concern in oncology and urology. It typically manifests between the ages of 65 and 84 and is more common in males. The primary types include transitional cell carcinoma, squamous cell carcinoma, and adenocarcinoma, with transitional cell carcinoma being the most prevalent.

Signs and Symptoms



Location of bladder cancer

Bladder cancer characteristically presents with blood in the urine (hematuria), which may be visible or microscopic. This symptom is typically painless and can be intermittent. Pain during urination, frequent urination, and a persistent urge to urinate are other potential symptoms, though they are not specific to bladder cancer. Advanced disease may present with pelvic or bony pain, lower-extremity swelling, or flank pain.

Causes

Smoking

Tobacco smoking is the primary known risk factor, accounting for over half of bladder cancer cases in men and a third in women. The risk increases with the duration and intensity of smoking.

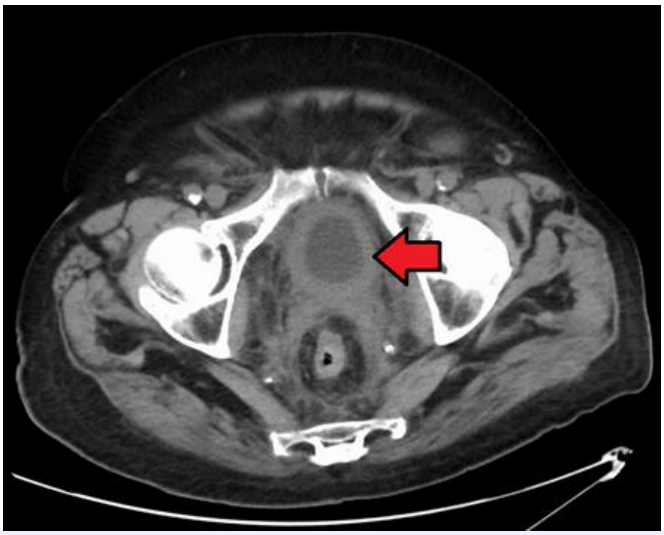
Quitting smoking reduces the risk but former smokers remain at a higher risk compared to never smokers.

Occupational Exposure
Occupational exposure to carcinogens such as benzidine, 4-aminobiphenyl, and others in industries like dye manufacturing, rubber, and leather work, also significantly increases the risk.

Infection
Infection with Schistosoma haematobium is a notable cause of bladder cancer, particularly squamous cell carcinoma. Chronic inflammation induced by the parasite's eggs can lead to carcinogenesis.

Diet and Other Factors
High consumption of animal fat and dietary cholesterol increases risk in men. External beam radiotherapy for prostate cancer also raises the risk of developing invasive bladder cancer.

Diagnosis



Bladder wall thickening due to cancer

Diagnosis primarily involves cystoscopy, where a cystoscope is used to inspect the bladder and obtain tissue biopsies. Transurethral resection of bladder tumour (TURBT) is very important for staging and determining treatment pathways. Imaging techniques like MRI and CT scans, along with urine cytology and various urine-bound markers, support diagnosis and staging.

Classification and Staging

Classification
Bladder cancers are classified based on histopathology into transitional cell carcinoma, squamous cell carcinoma, adenocarcinoma, and other less common types. Transitional cell carcinoma can further be subdivided based on cellular differentiation.

Staging

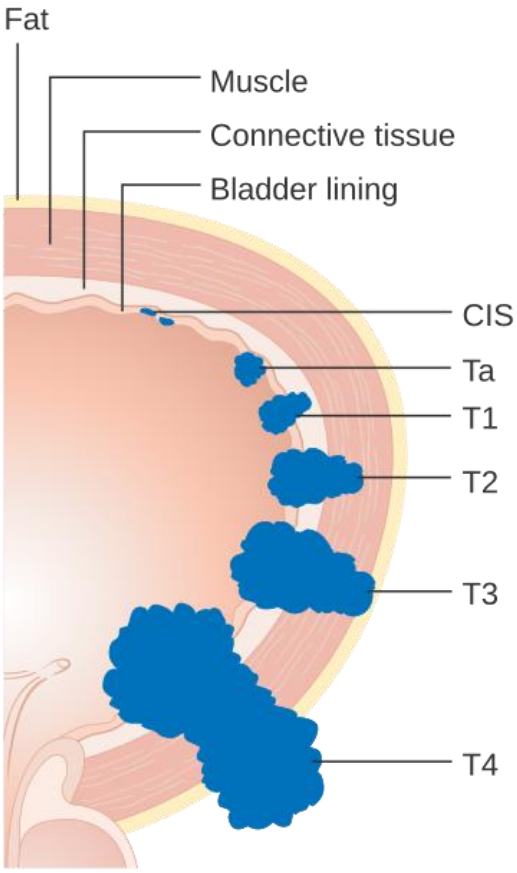


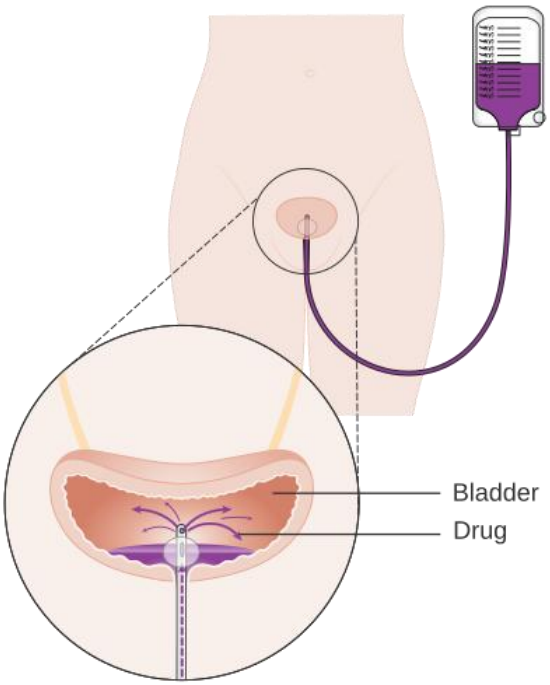
Diagram showing the T stages of bladder cancer

Bladder cancer staging follows the TNM system, considering tumour size (T), regional lymph node involvement (N), and distant metastasis (M). Tumours confined to the mucosa or invading the lamina propria are classified as Ta or T1, while those invading muscle are classified as T2, T3, or T4.

Treatment

Non-Muscle Invasive

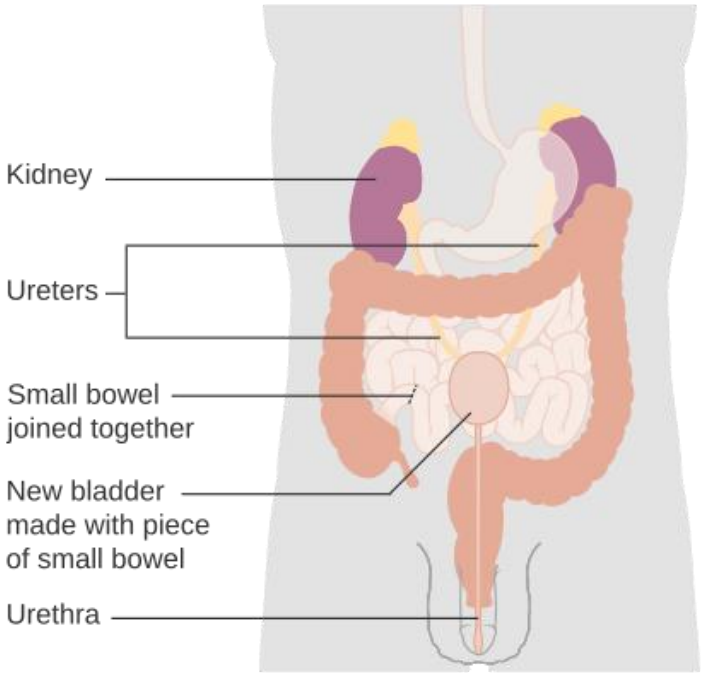
Treatment for non-muscle invasive bladder cancer primarily involves TURBT, possibly followed by intravesical chemotherapy or immunotherapy. Bacillus Calmette–Guérin (BCG) therapy is a common immunotherapy used to prevent recurrence.



Drug treatment (chemotherapy) into the bladder (Intravesical)

Muscle Invasive

For muscle invasive bladder cancer, treatment options include radical cystectomy (complete removal of the bladder), partial cystectomy, and urinary diversion. Neoadjuvant chemotherapy (before surgery) has shown a survival benefit. Chemoradiation (trimodal therapy) is an alternative for select patients.



Surgical reconstruction (neobladder) of the bladder following removal

Metastatic Disease

Metastatic bladder cancer is treated with cisplatin-based chemotherapy if the patient is fit for it. In cases where cisplatin is unsuitable, carboplatin-based regimens or immunotherapy with checkpoint inhibitors are used.

Prognosis

Prognosis depends on the stage at diagnosis. Non-muscle invasive cancers have a favorable outcome with a 5-year survival rate of 95%, while muscle invasive cancers have poorer outcomes. Advanced and metastatic bladder cancer has a median survival of 15 months with chemotherapy.

Self-assessment MCQs (select the best answer)

1. **Which age group is bladder cancer most commonly diagnosed in?**
a. 25-34
b. 35-44
c. 45-54
d. 55-64
e. 65-84

2. **Which type of bladder cancer is the most prevalent?**
a. Transitional cell carcinoma
b. Squamous cell carcinoma
c. Adenocarcinoma
d. Small cell carcinoma
e. Sarcoma

3. **What is the primary known risk factor for bladder cancer?**
a. High-fat diet
b. Physical inactivity
c. Smoking
d. Genetic predisposition
e. Alcohol consumption

4. **Which occupational exposure is NOT associated with an increased risk of bladder cancer?**
a. Dye manufacturing
b. Rubber work
c. Leather work
d. Textile manufacturing
e. Metal casting

5. **What is the most common initial symptom of bladder cancer?**
a. Pain during urination
b. Blood in the urine (hematuria)
c. Frequent urination
d. Persistent urge to urinate
e. Lower-extremity swelling

6. Which diagnostic procedure is primarily used to inspect the bladder for cancer and obtain tissue biopsies?

a. MRI
b. CT scan
c. Cystoscopy
d. Ultrasound
e. PET scan

7. What does TURBT stand for?

a. Transurethral Resection of Bladder Tumour
b. Transurethral Removal of Bladder Tissue
c. Transurethral Reconstruction of Bladder Tumour
d. Transurethral Radiation of Bladder Tumour
e. Transurethral Repair of Bladder Tissue

8. What does the 'T' in the TNM staging system for bladder cancer refer to?

a. Tumour size
b. Tumour type
c. Treatment
d. Therapy
e. Tumour markers

9. Which therapy is commonly used to prevent recurrence of non-muscle invasive bladder cancer?

a. Radiation therapy
b. Bacillus Calmette–Guérin (BCG) therapy
c. Systemic chemotherapy
d. Hormone therapy
e. Targeted therapy

10. What is the 5-year survival rate for non-muscle invasive bladder cancer?

a. 50%
b. 65%
c. 75%
d. 85%
e. 95%